Helicopter Air Taxi Analysis
2013 Formula 1

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Executive Summary

The Circuit of the Americas (COTA) hosted Austin's annual Formula 1 (F1) event the weekend of November 15-17, 2013. The COTA facility is located in a rural section of southeast Travis County near the intersection of FM 812 and SH 130. The Formula 1 event includes for hire helicopter air taxis services. In addition to helicopter air taxis, the event utilizes helicopter operations to support public safety, event security, media and race event television production.

The helicopter air taxi operators utilized several permanent heli-facilities and one temporary heli-facility within the City of Austin's incorporated limits. The permanent heli-facilities were primarily located at existing airports in Austin and the surrounding area.

The City of Austin Department of Aviation (DOA) is responsible for approving temporary heli-facilities within the City of Austin's incorporated limits and extraterritorial jurisdiction. The DOA approved one location near Austin's downtown core at 901 South MoPac.

Helicopter operators were debriefed on noise abatement best practices, including the Fly Friendly Corridor Program to reduce community noise impacts. The Fly Friendly Corridor Program identifies flight paths that reduce residential area over flights, by directing helicopters to follow major highways and waterways.

The report identifies heli-facility locations, helicopter operator statistics, helicopter flight paths, complaint information and compares 2013 helicopter operations to 2012. The DOA also analyzed helicopter and community background noise levels associated with the temporary heli-facility.

Aircraft Noise and Flight Track Monitoring System

ABIA owns and operates an aviation industry approved computerized aircraft noise and flight track data collection system. The Aircraft Noise and Operations Monitoring System (ANOMS 8) developed by Brüel & Kjær, fuses data from a wide range of sources to generate an aircraft flight track and its associated noise footprint. The ANOMS system received extensive upgrades and third party verifications in 2012.

ANOMS collects flight track data using the Federal Aviation Administration's (FAA) airport surveillance radar and the aircraft's transponder. Aircraft noise data is collected from strategically located fixed and portable noise monitors. The system also incorporates current weather conditions and noise complaints to generate a comprehensive view of an aircraft operation in the Austin area.

Noise Evaluation Methodology

Title 13 of City of Austin Code requires temporary heli-facilities to be evaluated for potential noise impacts on surrounding receptors. ABIA used two methods to evaluate noise levels at the approved temporary heli-facility located at 901 South MoPAC, Austin, Texas.

ABIA initially modeled the proposed helicopter noise levels using the FAA's Integrated Noise Model (INM) software. Modeling occurred during the temporary heli-facility application process. Model generated noise contours incorporate helicopter type, number of operations per day, arrival paths, departure paths and weather conditions.

ABIA measured actual noise levels during the 2013 F1 event at three sites around the temporary heli-facility using two portable noise monitors strategically placed adjacent to the temporary heli-facility.

The modeled and measured noise levels generated noise contours using two aviation industry approved noise metrics. The equivalent sound level (L_{eq}) noise metric measures noise over a specified period of time and the maximum sound level (L_{max}) noise metric measures the noise level for one specific noise event. The outputs generated from these tools are summarized in Table 3, Table 4, Figure 10 and Figure 12.

Austin Area Helicopter Operations Summary.

Figure 1 illustrates the increase in helicopter operations during the F1 event versus an average weekend. The increase was approximately 307%.

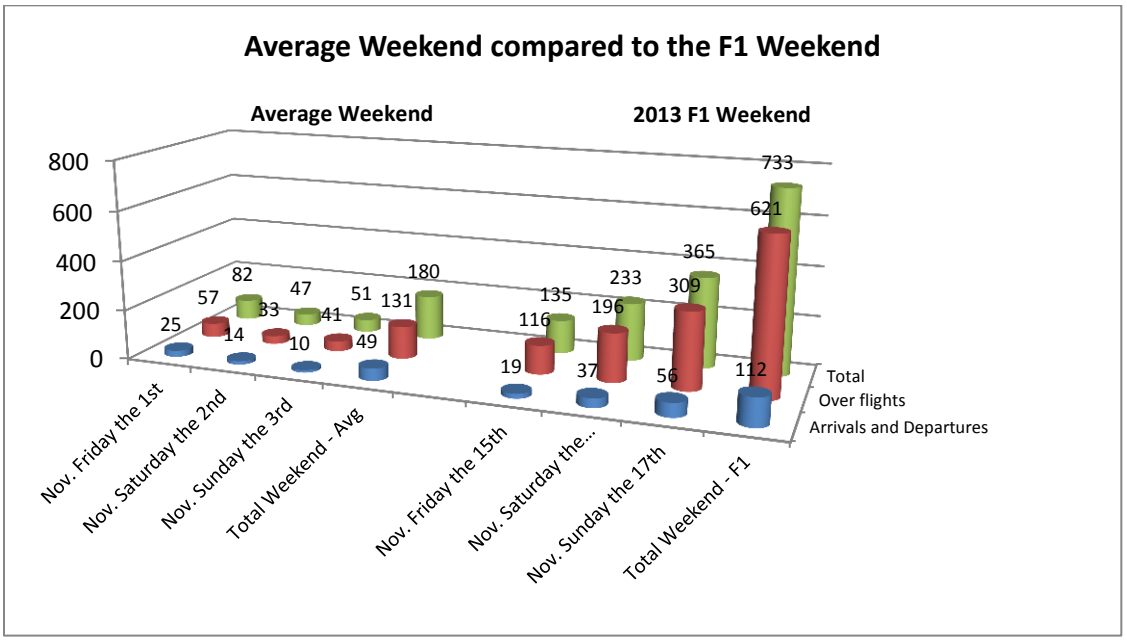


Figure 1

Figure 2 illustrates the decrease in 2013 helicopter operations from the previous year's event. The 2013 F1 event had a helicopter operation reduction of approximately 70%.

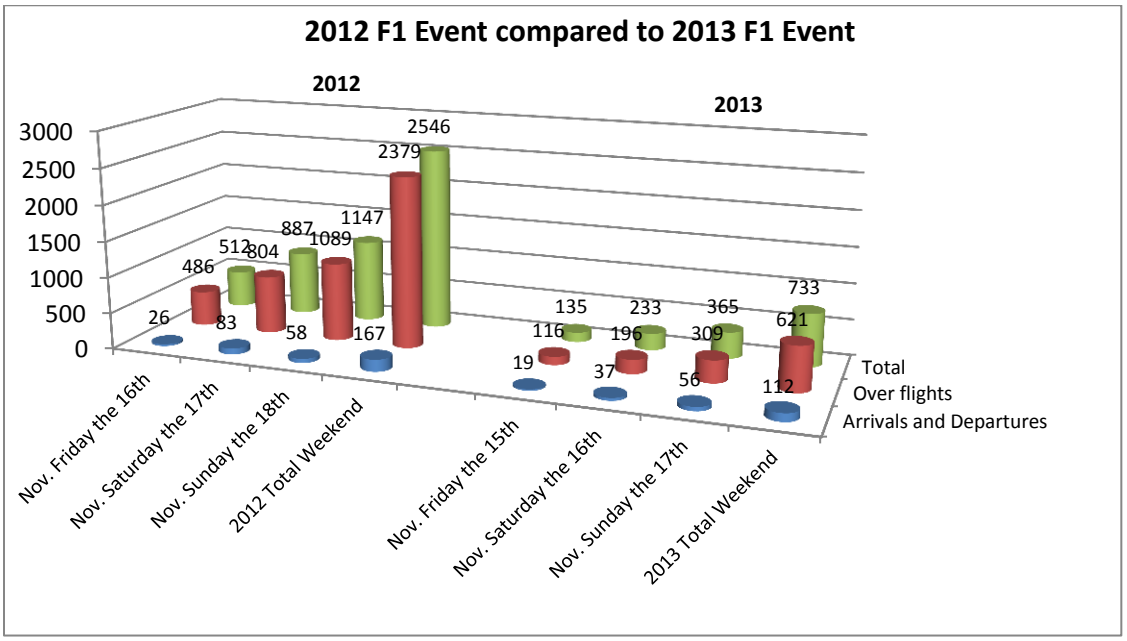


Figure 2

Heli-facility Operations Summary

The statistics for the individual heli-facility operations are approximately 90% accurate.

Heli-facility	Friday	Saturday	Sunday	Total per site	Percentage
Executive Airport (EDC)	13	23	60	96	**13.15%**
Dryden Airport (TX05)	12	21	29	62	**8.49%**
ABIA FBOs (AUS)	19	39	61	119	**16.30%**
Barton Oaks Plaza (9TA2)	20	27	33	80	**10.96%**
Barton Creek Golf Club (58TA)	7	31	53	91	**12.47%**
Horseshoe Bay (DZB)	6	7	20	33	**4.52%**
San Marcos Airport (HYI)	4	6	15	25	**3.42%**
Unknown	51	79	94	224	**30.68%**
Total per day	**132**	**233**	**365**	**730**	

Table 1

Heli-facility locations and helicopter flight tracks

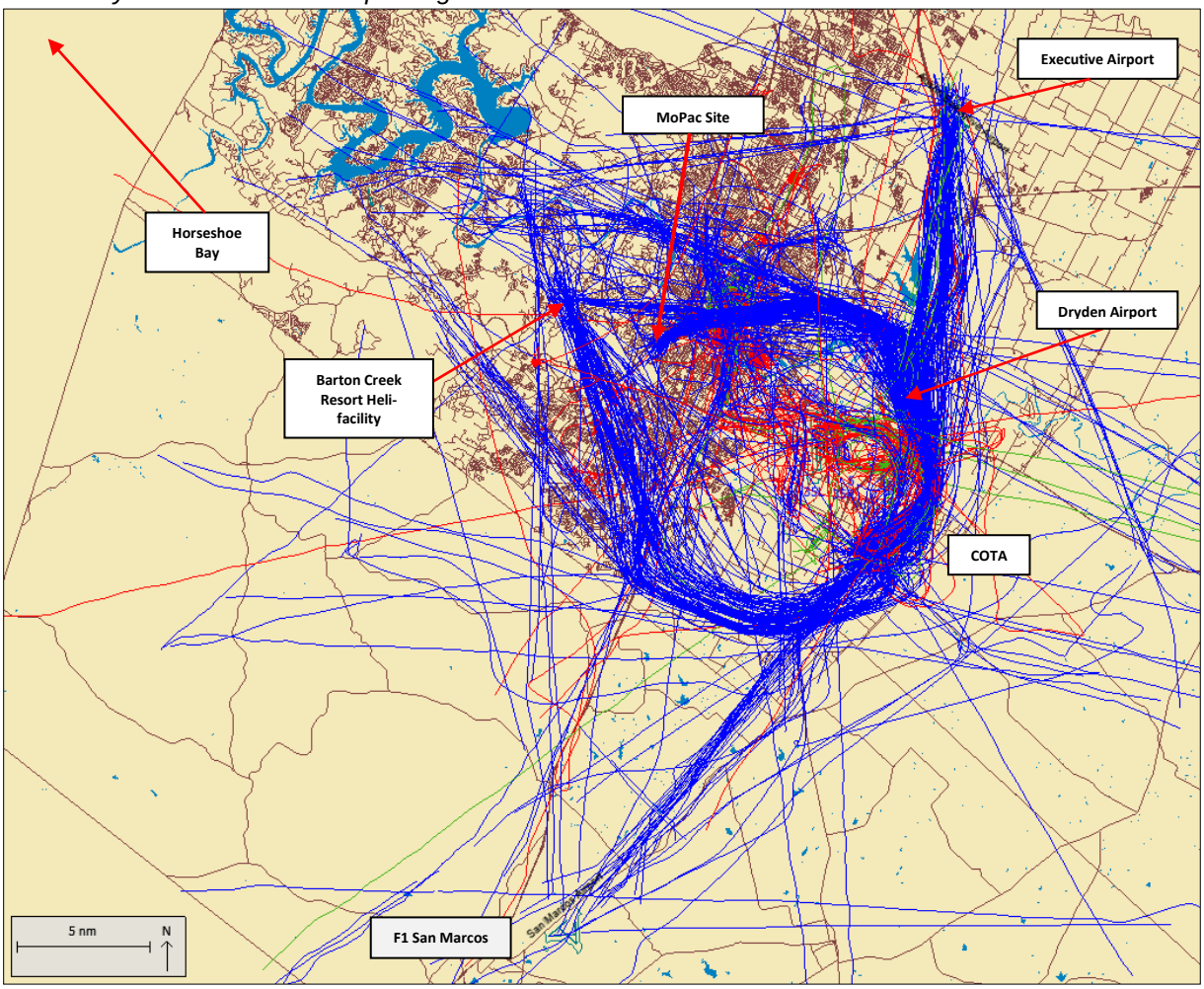


Figure 3

Helicopter Operator Summary

Helicopter operators were assigned transponder codes prior to the event, which allowed ABIA to approximate the number of operations for each individual operator. **Appendix B** includes figures illustrating the individual operator flight paths.

Helicopter Operator	Total Flight Paths	Percentage
Finns Up Aviation	129	17.6%
McRae	78	10.7%
Eurocopter	29	4.0%
Capital Wings	76	10.4%
Paradigm	48	6.6%
Helimotion	42	5.7%
RJ Machine	44	6.0%
T & M	39	5.3%
Ty-Tex	35	4.8%
RACE17	20	2.7%
Air Center	9	1.2%
All others	182	24.9%
Total	**731**	

Table 2

Fly Friendly Corridor Program

The helicopter operators were encouraged to use best practices for noise abatement, including but not limited to, the use of the Fly Friendly Corridor Program to avoid flight paths over residential areas. **Figure 4** illustrates the 2013 F1 event helicopter flight paths. Warmer colors identify primary flight paths used by the operators which align with recommended noise abatement practices.

Helicopter Flight Path Density; Friday November 15h through November 17h.

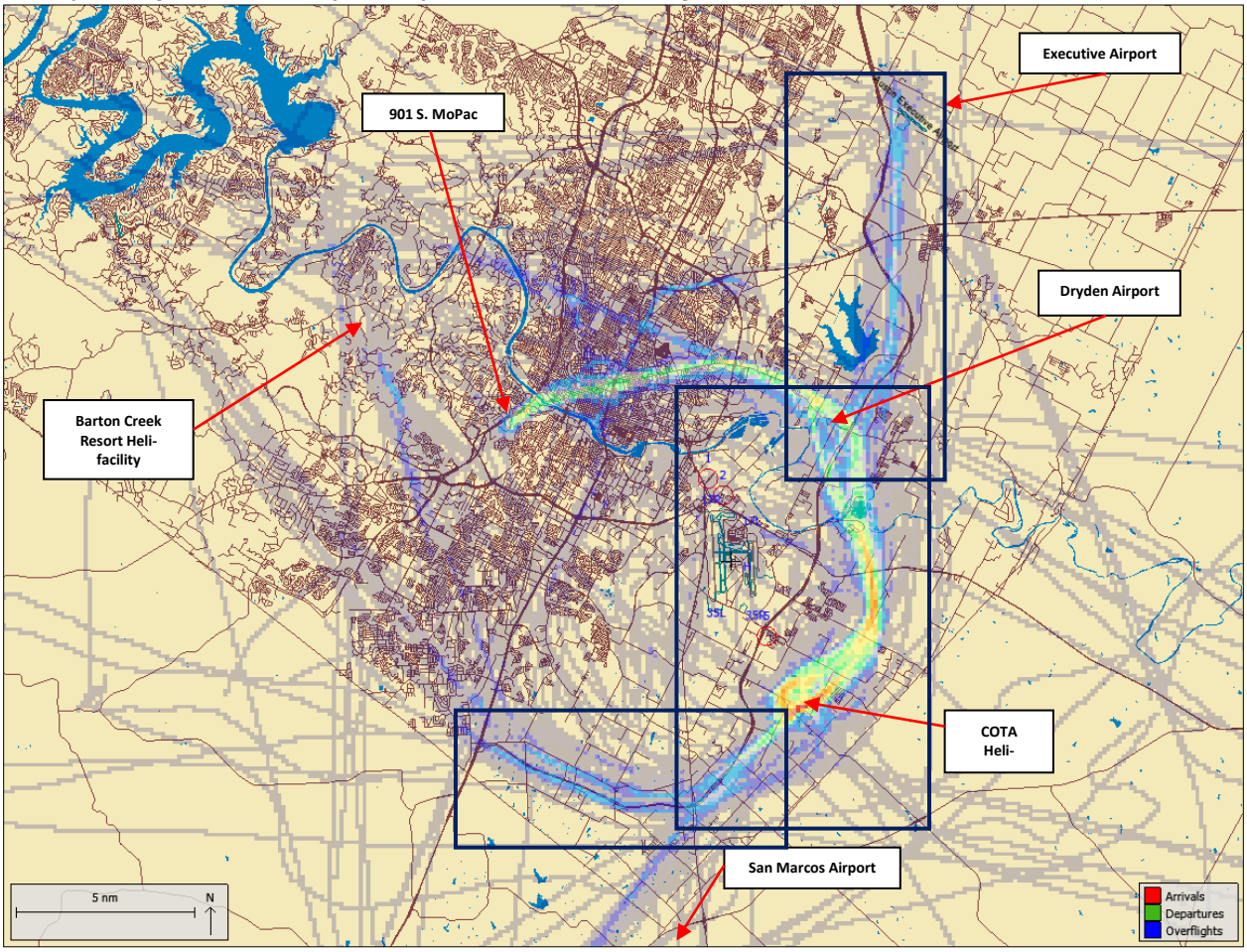


Figure 4

Complaints

The 2012 F1 event generated 116 complaints and the 2013 F1 event generated 3 complaints. **Figure 5** identifies the 2013 event complaint locations (red squares) as wells as helicopter flight paths.

Helicopter Flight Path Density Map with complaints (Friday November 15th through November 17th)

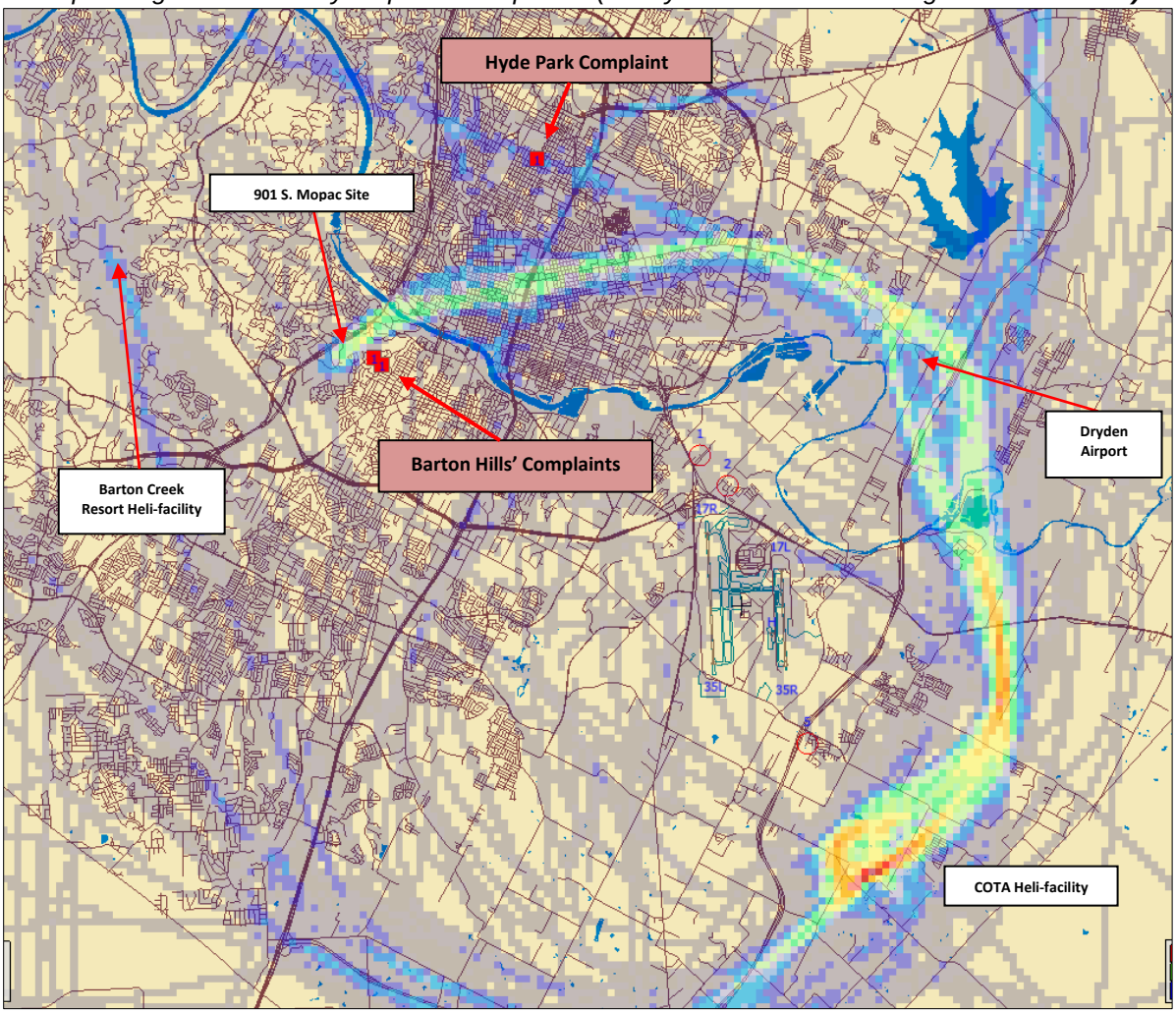
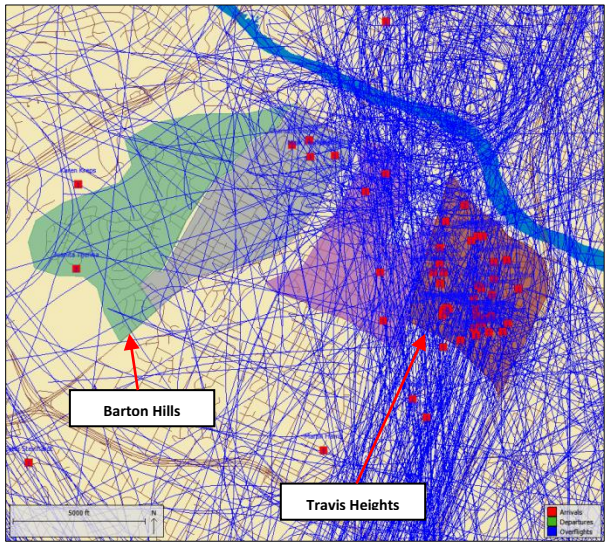


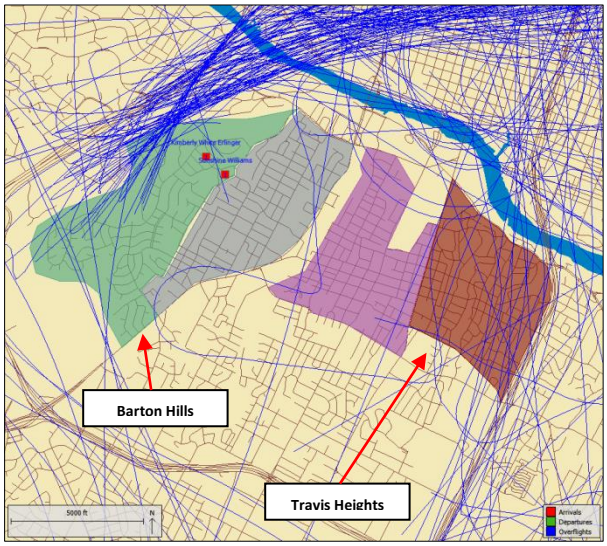
Figure 5

South Austin Helicopter Flight Path Comparison

Figures 6 and 7 are snapshots that illustrate the dramatic change in south Austin helicopter operational patterns from the 2012 F1 event to the 2013 F1 event.



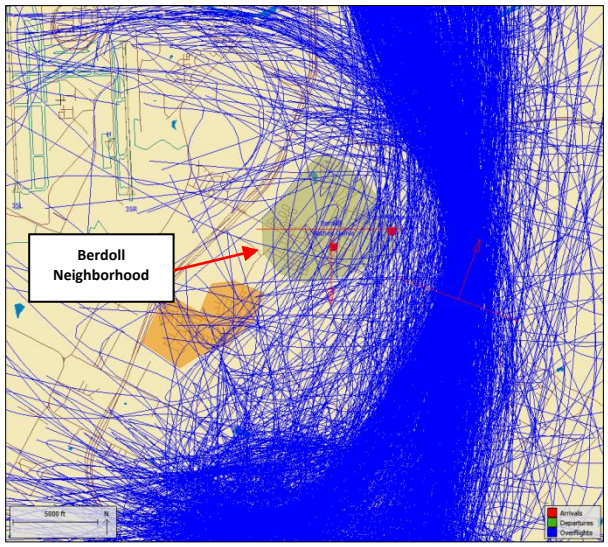
2012 Figure 6



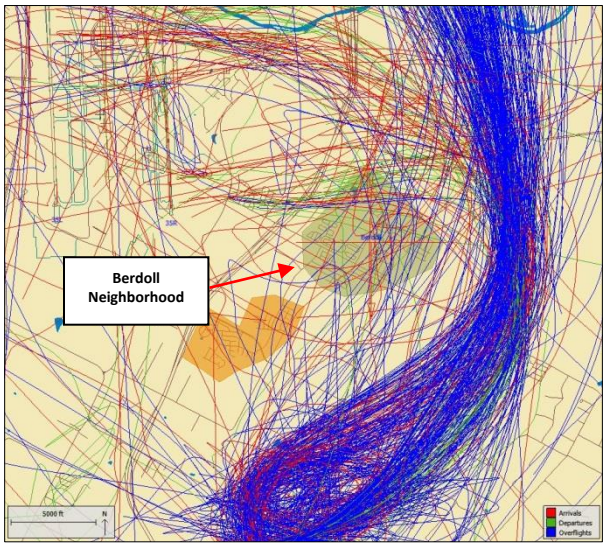
2013 Figure 7

COTA Helicopter Flight Path Comparison

Figures 8 and 9 are snapshots that illustrate the change in COTA helicopter operational patterns from the 2012 F1 event to the 2013 F1 event.



2012 Figure 8



2013 Figure 9

Temporary Heli-facility Noise Summary (MoPAC site)

L_{eq} Noise Contours

Figure 10 illustrates the modeled L_{eq} noise contours for the temporary heli-facility site. The contours were generated using applicant provided helicopter types, the number of operations per day, and the proposed arrival and departure paths.

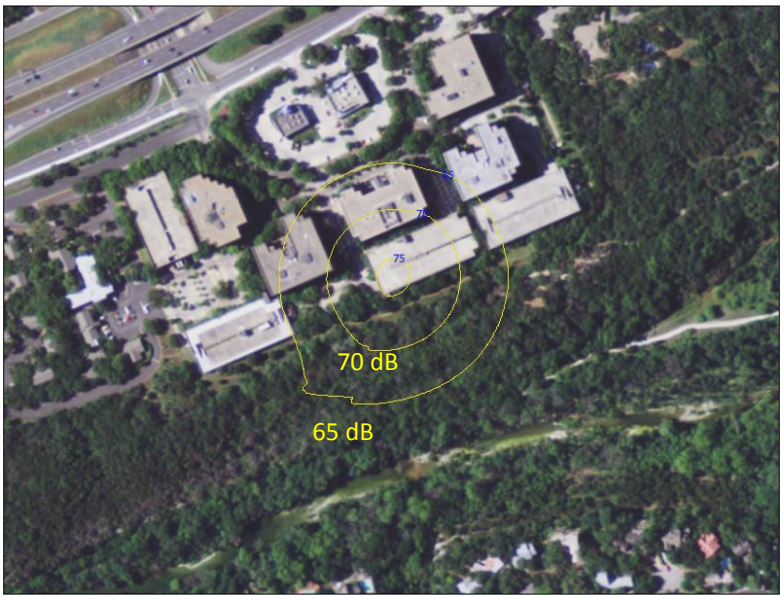


Figure 10

The DOA selected three sites adjacent to the temporary heli-facility for portable noise monitor placement. (**Figure 11**) The noise monitors separate aircraft noise from community background noise (vehicle traffic, etc.) Table 3 summarizes modeled L_{eg} aircraft noise levels, measured L_{eq} aircraft noise levels and measured L_{eq} community background noise levels.

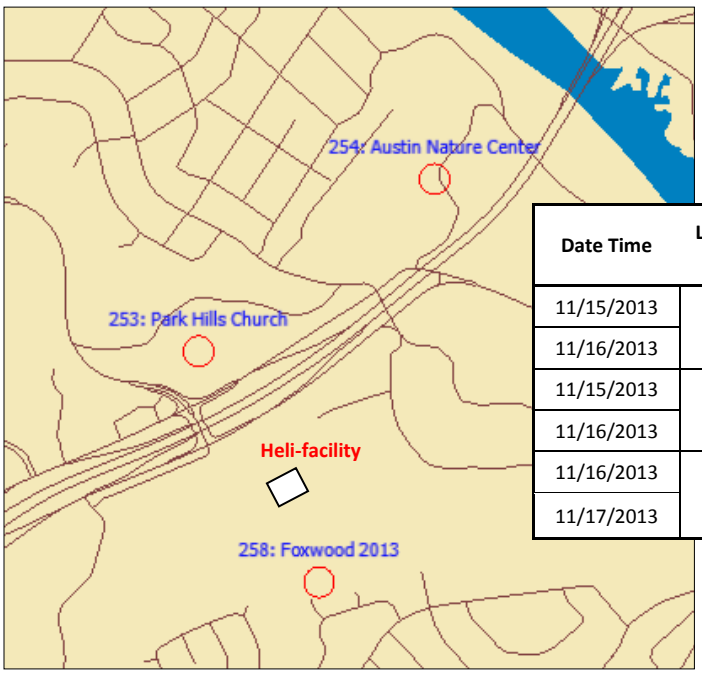


Figure 11

Date Time	Location ID	Modeled Aircraft Leq	Measured Aircraft Leq	Measured Community Leq
11/15/2013	253	48.4	48.6	65.5
11/16/2013			50.9	62.2
11/15/2013	254	48.3	45.7	62.6
11/16/2013			0	51.1
11/16/2013	258	54.1	52.8	57.1
11/17/2013			51.7	53.5

Table 3

L_{max} Noise Contours

Figure 12 illustrates the modeled L_{max} noise contours for the temporary heli-facility site based on applicant provided helicoptor type, and assuming helicopter arrivals are from the north and departures are to the south.

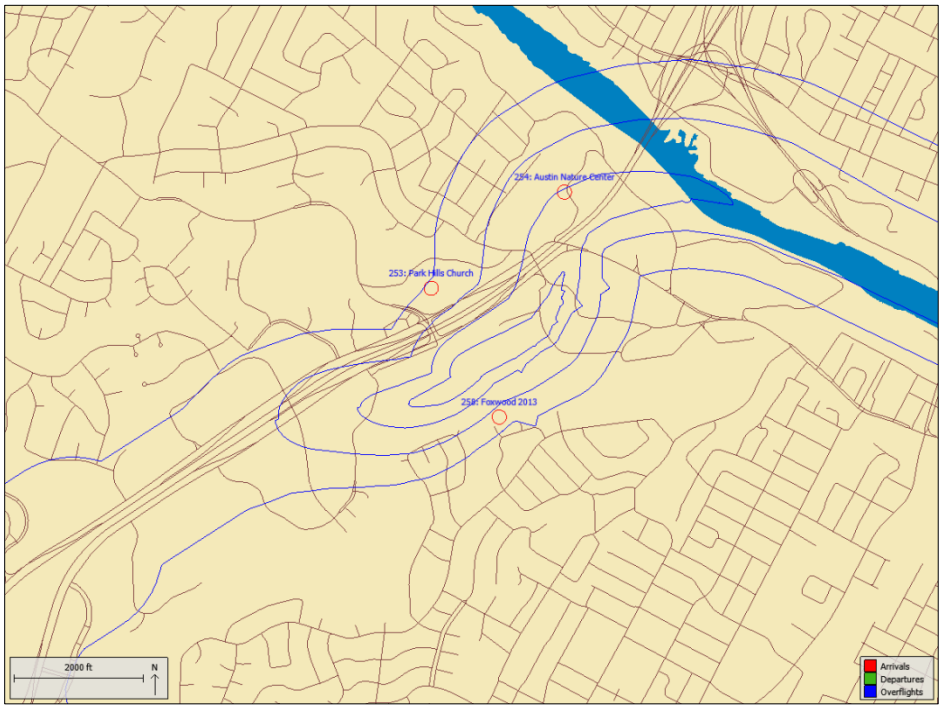


Figure 12

Table 4 summarizes modeled L_{max} aircraft noise levels, measured L_{max} aircraft noise levels and measured L_{max} community background noise levels.

	Modeled Aircraft Noise - Anticipated Lmax	Measured Aircraft Noise - Lmax	Measured Community Noise - Lmax
253: Park Hills Church	65.8	79.9	101.4
254: Austin Nature Center	75.4	74.4	98.9
258: Foxwood	67.7	78.7	81.3

Table 4

Noise comparison chart

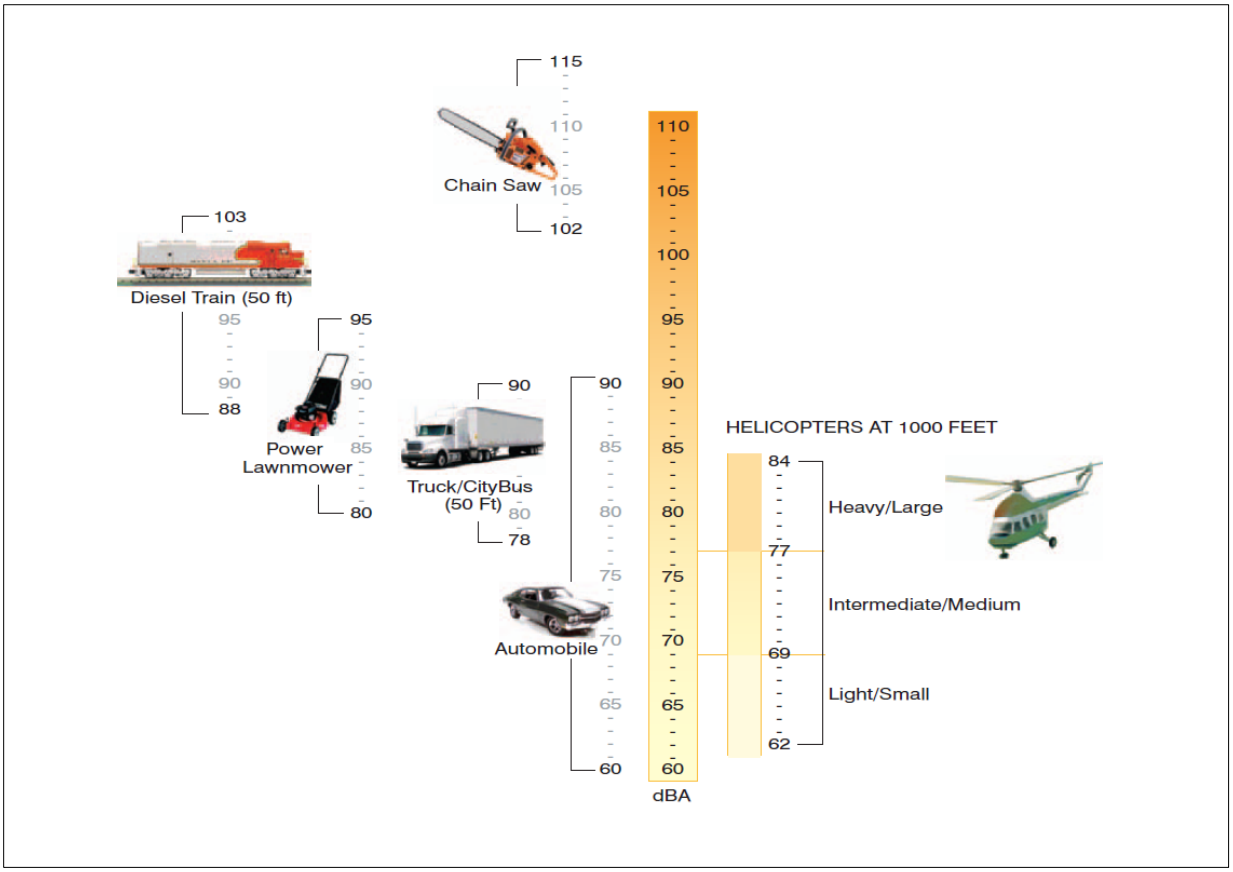


Figure 13

Conclusion

The 2013 Formula 1 event had significant reductions in total helicopter operations, noise complaints and flight paths over residential areas, as compared to the inaugural event in 2012. Noise complaints alone were reduced by 97% in 2013.

Helicopter noise modeling is required for a Category II temporary heli-facility permitting per City Code. ABIA used two noise metrics to predict noise levels adjacent to the temporary facility, one method measures noise levels over a specified period of time L_{eq} and the other measures the maximum noise level per noise event L_{max}. The Leq noise metric is required by City Code during the application process.

The modeled and measured helicopter noise levels using the L_{eq} metric were very similar (Table 3). The modeled and measured helicopter noise levels using the L_{max} metric had significant variations at two of the noise monitoring sites (Table 4). The difference is believed to be attributed to the temporary heli-facility operator using a second helicopter of which the make and model was unknown when the application was processed. Fins Up Aviation operated the temporary heli-facility in 2013.

The City of Austin, community stakeholders, helicopter operators and ABIA expended extensive resources in early 2013 to improve F1 event helicopter operations. This working group updated Title 13 of the City of Code which was approved by the City of Austin Council. The benefits of their efforts were clearly represented at the 2013 F1 event as detailed in this report.

ABIA staff is available to provide additional information on this report upon request. Please contact Mr. Stephen Dick at (512) 530-5541

Appendix A - Glossary of Terms

ANOMS:	Aircraft Noise and Operations Monitoring System
ATC:	Air Traffic Control
Class C Airspace	Class C Airspace is the airspace from the surface to 4,000 feet above the airport elevation. Class C airspace will only be found at airports that have an operational control tower, are serviced by a radar approach control, and that have a certain number of IFR operations. Although Class C airspace is individually tailored to meet the needs of the airport, the airspace usually consists of a surface area with a 5 nautical mile (NM) radius, an outer circle with a 10 NM radius that extends from 1,200 feet to 4,000 feet above the airport elevation and an outer area. Pilots must establish and maintain two-way radio communications with the ATC facility providing air traffic control services prior to entering airspace.
Decibel (dB):	Sound is measured by its pressure or energy in terms of decibels. The decibel scale is logarithmic; when the decibel level increases by 6 dB, the measured sound is twice as loud.
DNL:	Day Night Levels; a logarithmic average of sound levels in A-weighted decibels based on a 24-hour equivalent Sound Level (Leq) weighted to account for increased noise sensitivity between night time hours of 10:00 p.m. and 7:00 a.m.
FAA:	Federal Aviation Administration
FBO:	Fixed Base Operators
FlightTrak:	One component of the ANOMS system installed at the airport to passively "listen" to the FAA's Airport Surveillance Radar and to the aircraft transponder.
GA:	General Aviation
Leq:	*Equivalent Sound Level*; a measure of the exposure resulting from the "energy averaged" A-weighted sound levels over a specific period of time. Its value represents one constant sound level for the specific time period that contains as much sound energy as the actual varying sound levels that existed during the time period.
L_{max}	*Maximum Sound Level*; is the maximum sound level for one noise event.
Mode S transponder	Part 91 general aviation aircraft are not required to have mode S or TCAS systems. Part 121 operators operation within the USA with more than 30 seats must be equipped with TCAS II. Mode S is required with TCAS II system
NMT:	Noise Monitoring Terminal (microphone)
Noise:	Generally considered to be any sound, which is deemed undesirable by an individual.
Noise Abatement:	A measure or action that minimizes the amount or impact of noise on the environs of an airport. Noise abatement measures include aircraft operating procedures and use or disuse of certain runways or flight tracks. These operating procedures are controlled by the FAA.
Noise event:	When noise at a microphone exceeds a floating threshold for a specific length of time.
SEL:	Sound Exposure Level (noise metric); a measure of the physical energy of the noise event which takes into account both intensity and duration. People do not hear SEL. SEL takes all of the energy under the line in a noise versus time chart and compresses it to a 1-second value. SEL is typically used to compare noise events of varying durations and intensities. It is also the underlying data for aircraft noise curves in the INM.
Sound:	A rapid variation in air pressure, which is perceived by the ear and brain as sound.

Appendix B - Flight Paths by Operator

Fins Up Aviation – 129 paths

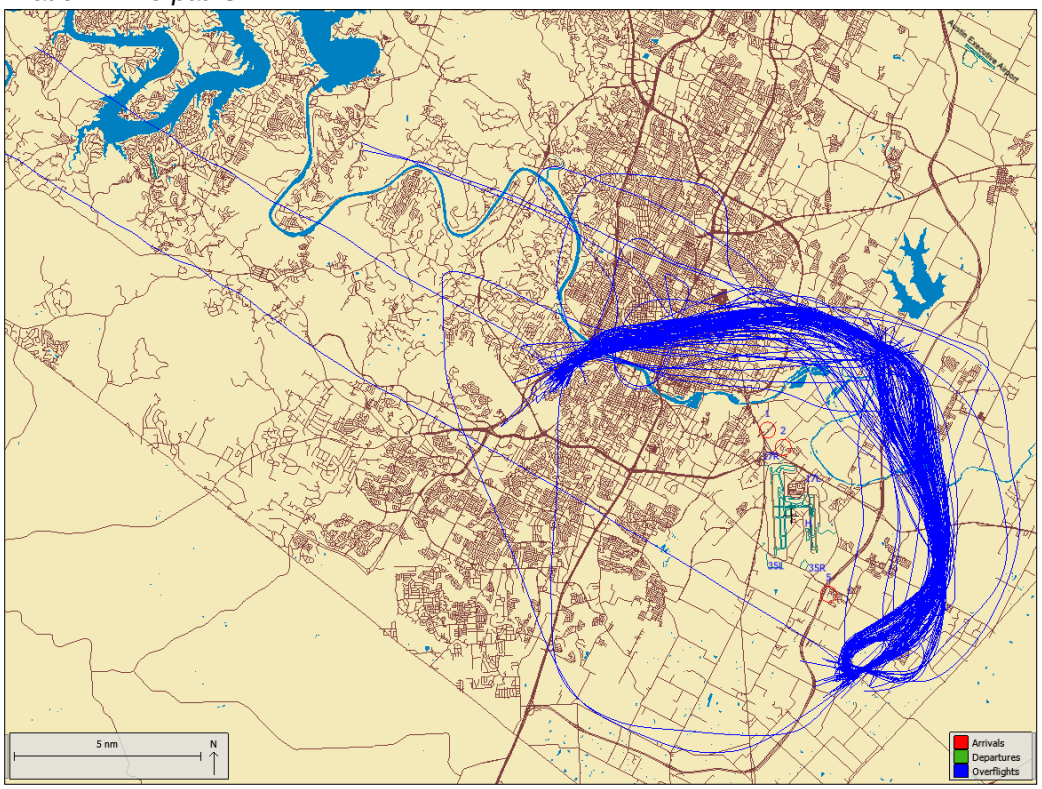


Figure 6

McRae – 78 paths

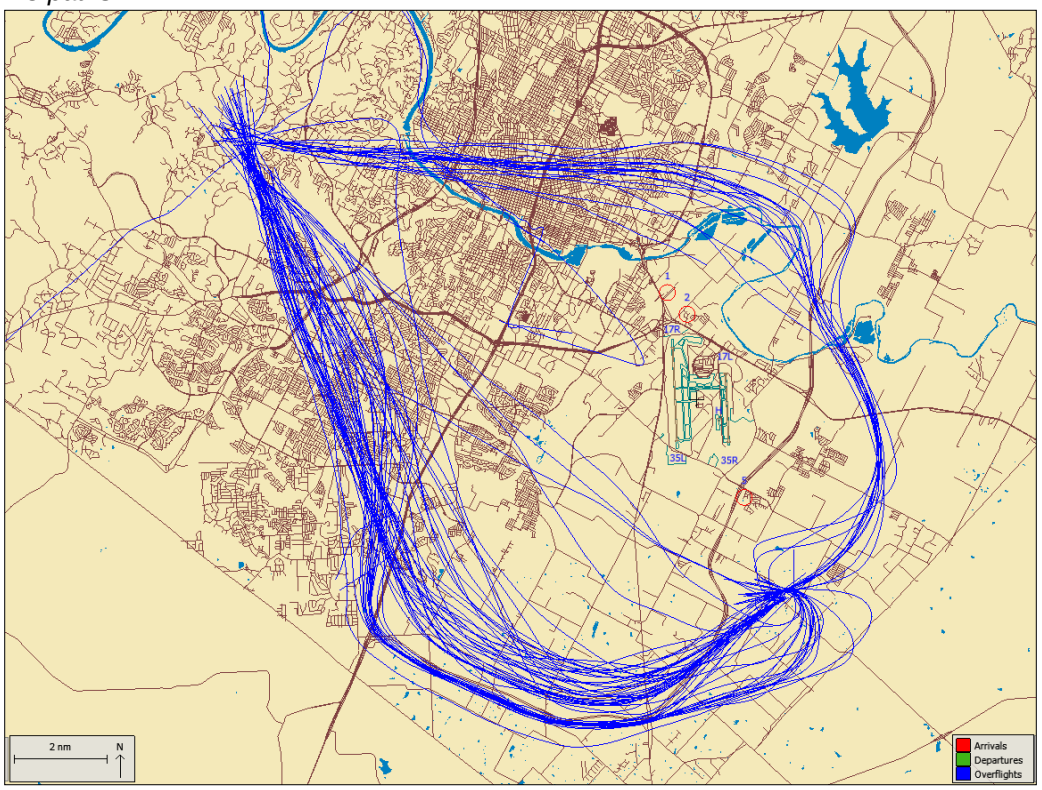


Figure 7

Capital Wings – 76 paths

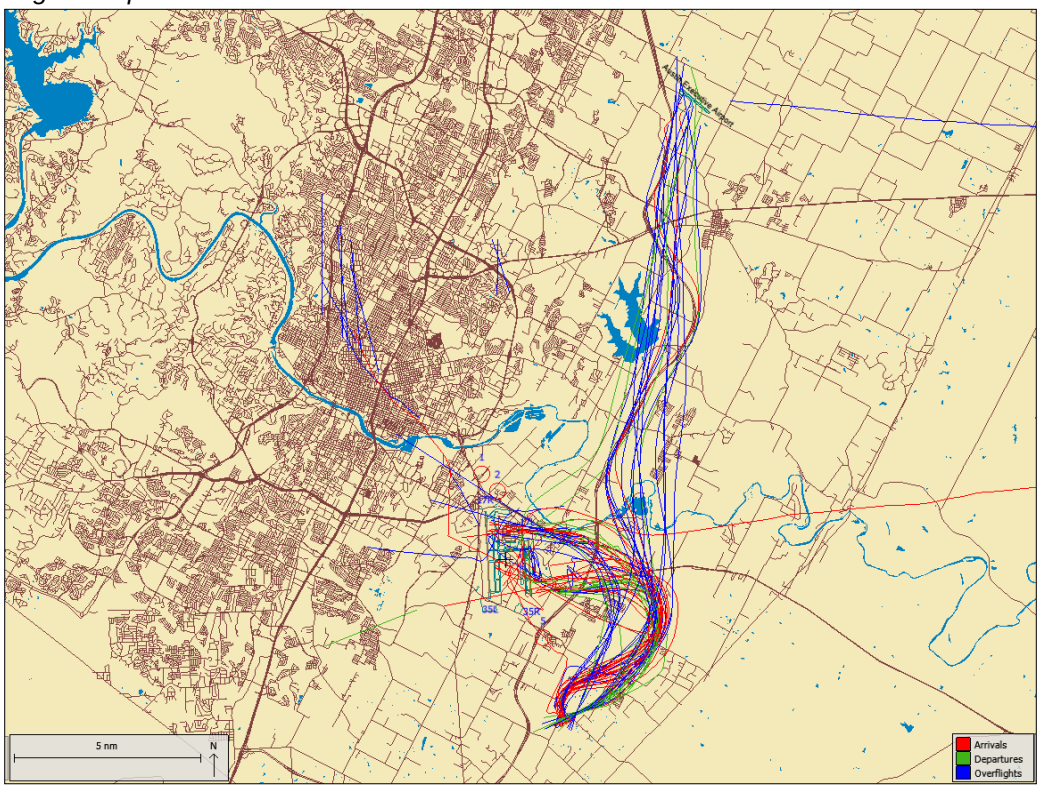


Figure 8

Paradigm – 48 paths

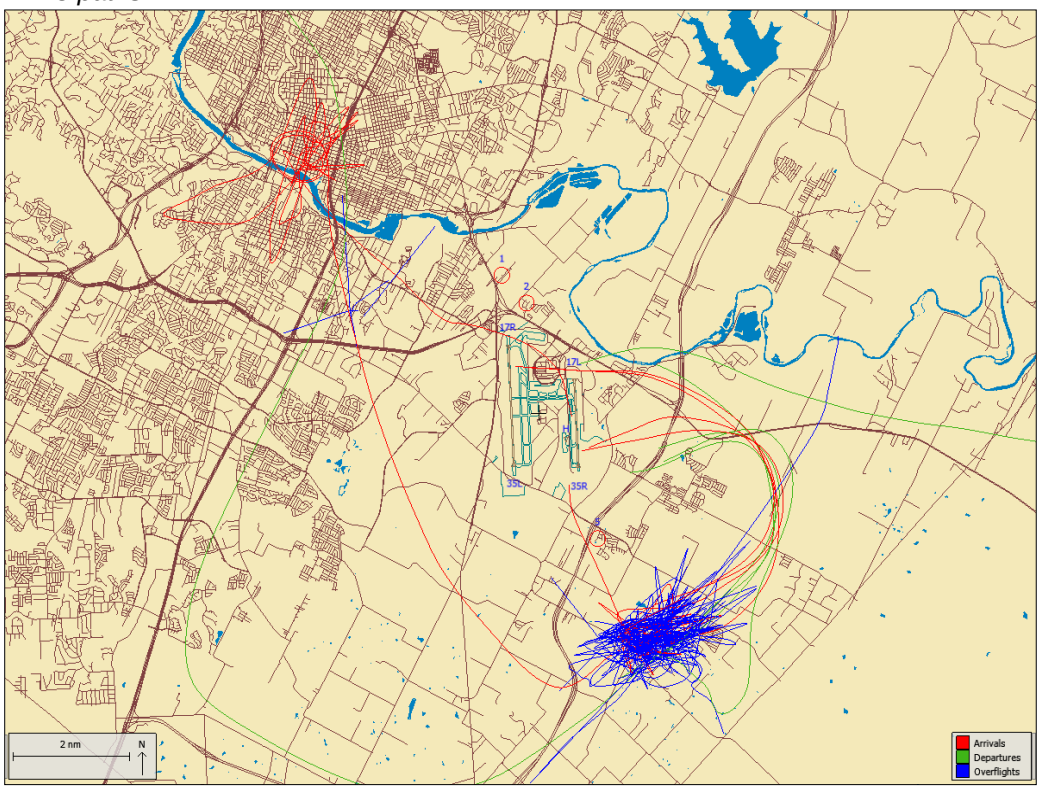


Figure 9

RJ Machine – 44 paths

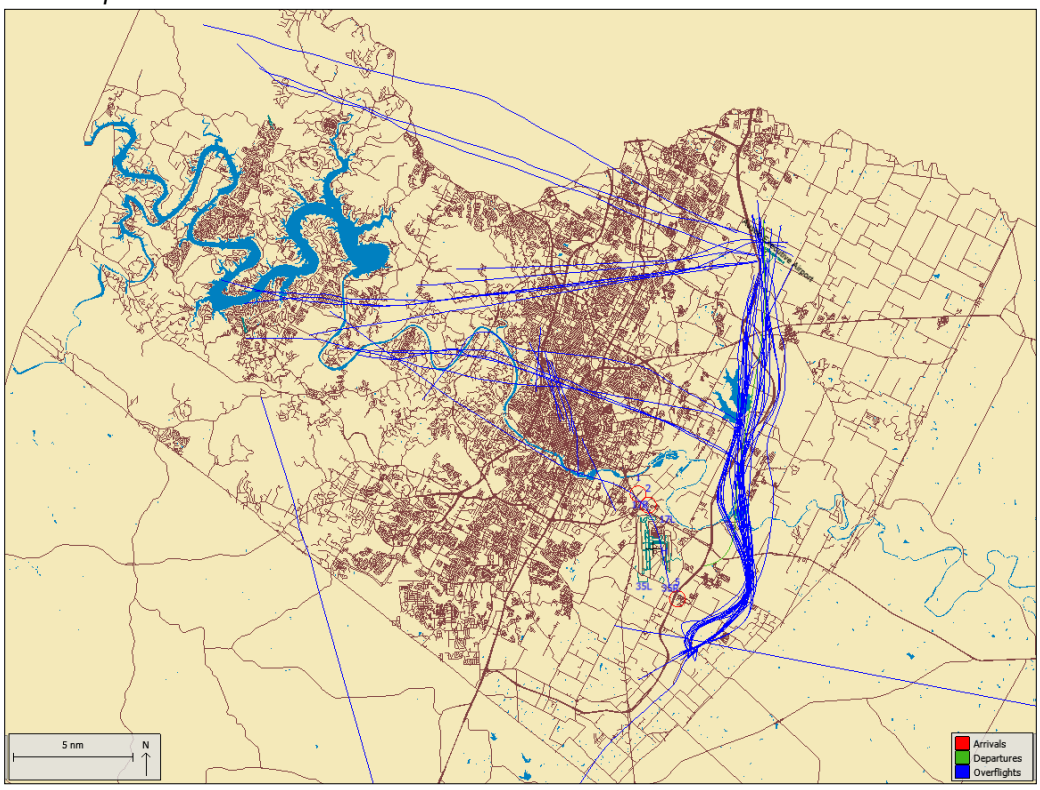


Figure 10

Helimotion – 42 paths

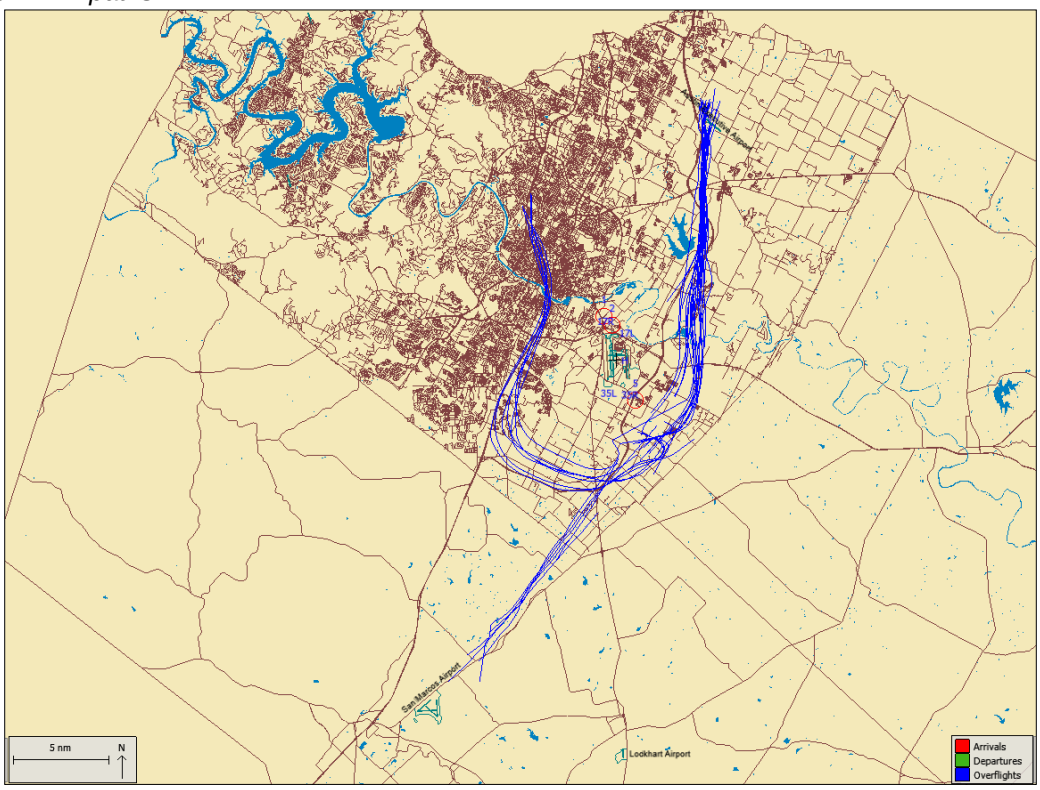


Figure 11

T & M – 39 paths

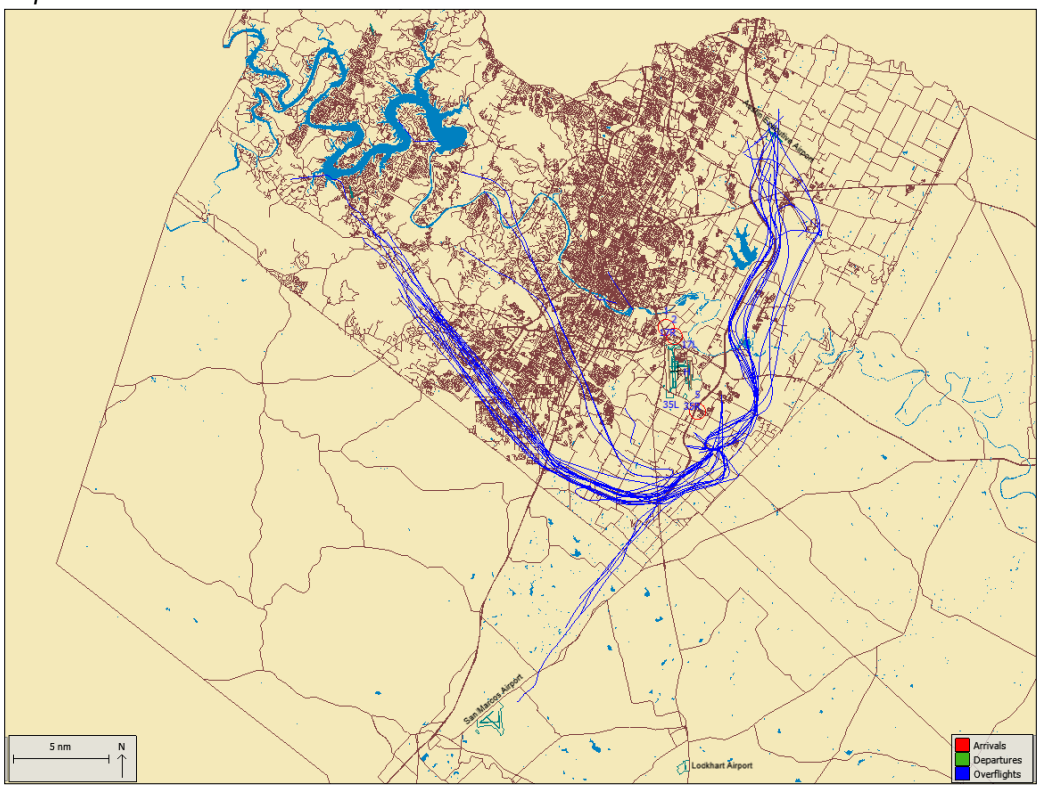


Figure 12

Ty-Tex – 35 paths

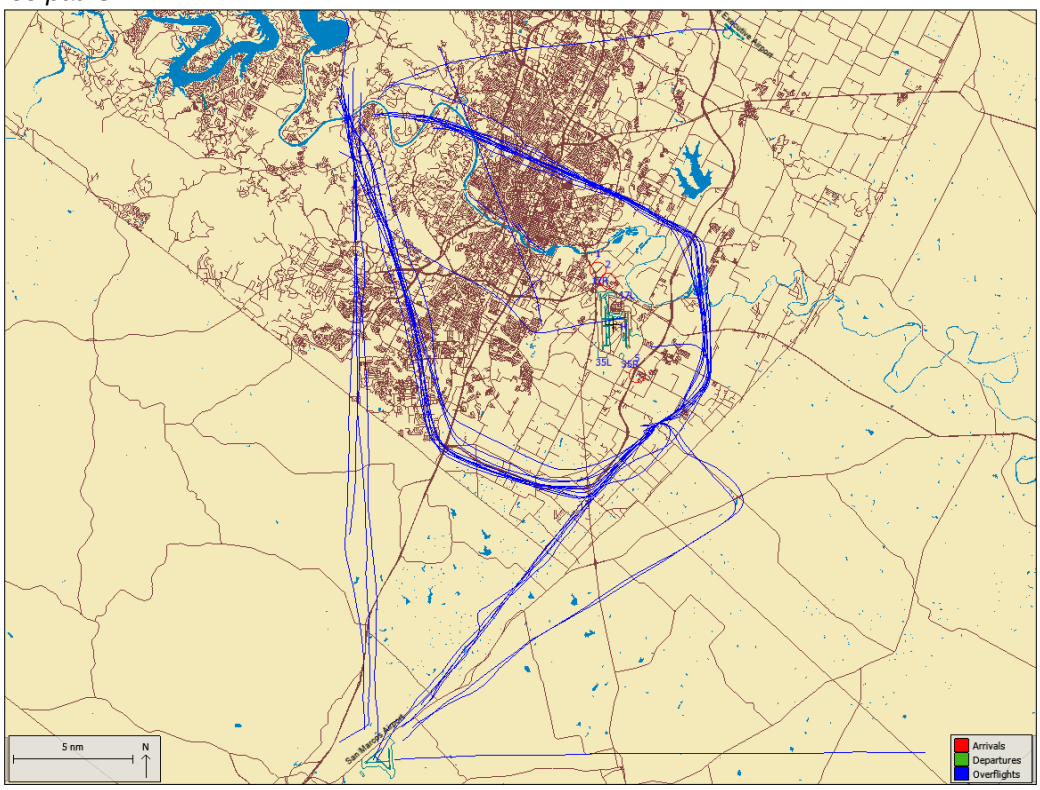


Figure 13

Eurocopter – 29 paths

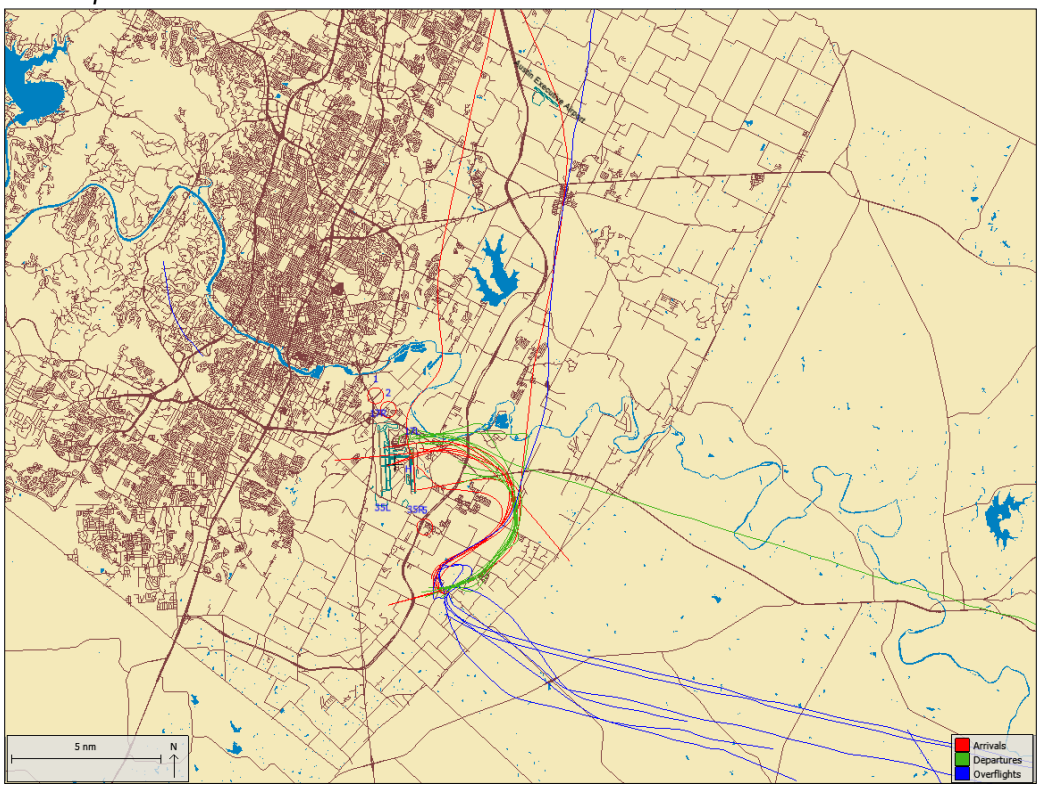


Figure 14

RACE17 – 20 paths

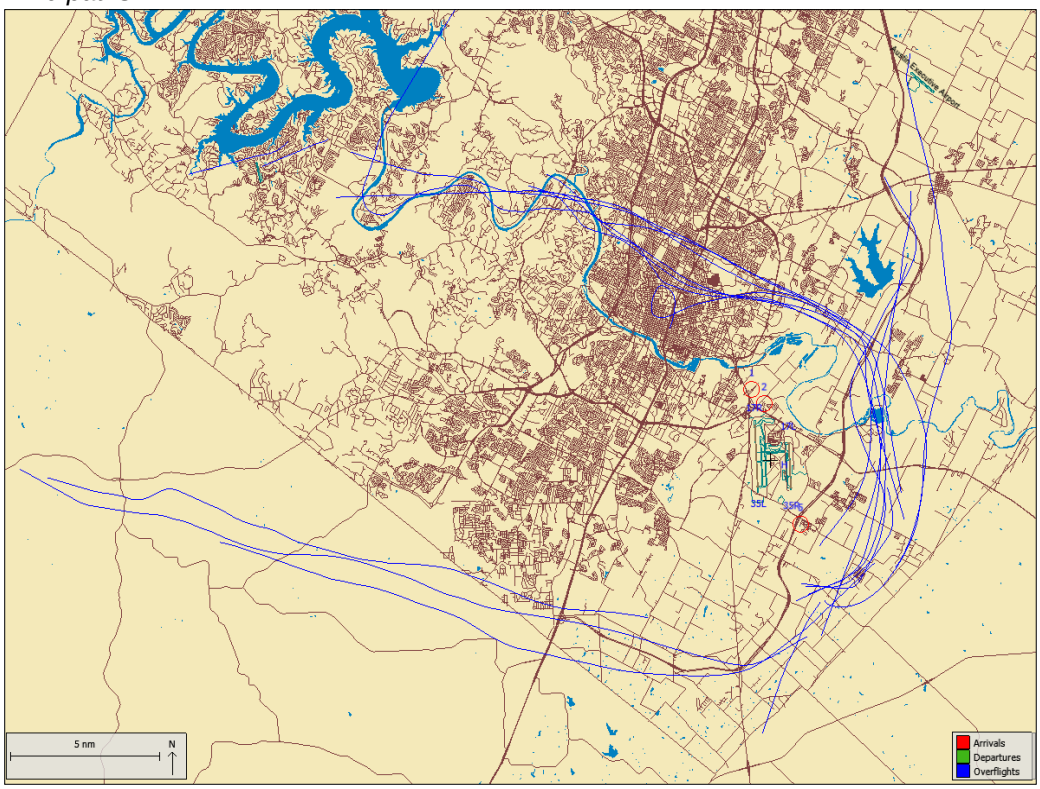


Figure 15

Air Center – 9 paths

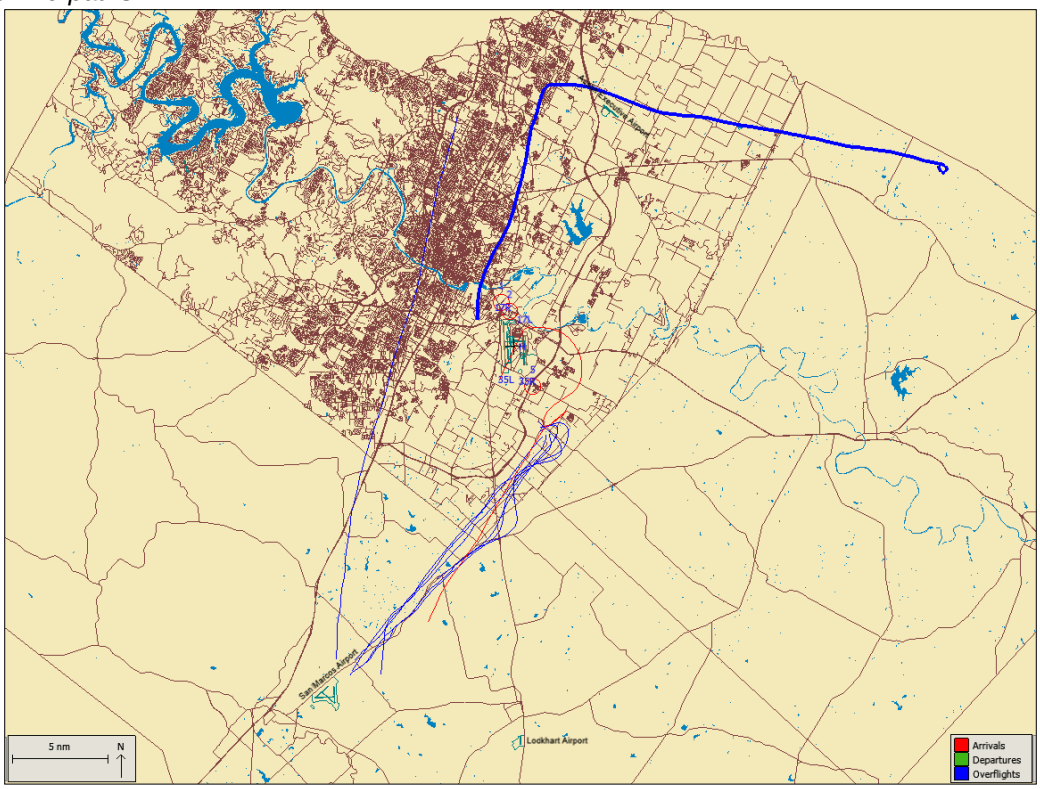


Figure 16

APD, DPS, Travis County and other paths not identified as air taxis – 182 paths

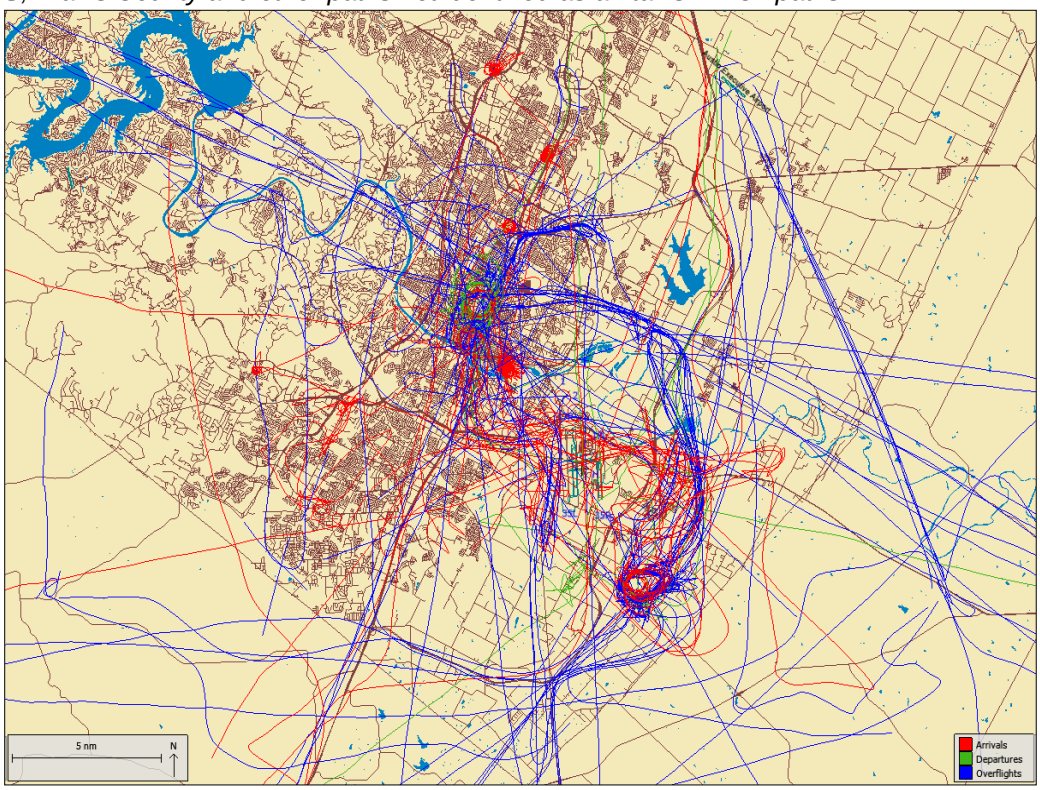


Figure 17